

REMARKS

Upon entry of the present amendment, claims 1-19 will remain pending in the above-identified application with claims 1-2, 4, 8 and 11-14 standing ready for further action on the merits and claims 3, 5-7 and 9-10 standing withdrawn from consideration based upon an earlier Restriction Requirement.

Claims 1-14 have been amended to correct informalities. New claims 15-19 have been added. No new matter is being introduced by the present amendments to the claims. As such entry of the instant amendment and favorable action on the merits is earnestly solicited at present.

Claim Rejections under 35 U.S.C. § 112

In the outstanding Office Action, claims 1-2, 4, 8 and 11-14 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicants regard as their invention. The rejection is respectfully traversed.

Claims 1-2 and 12 have been amended according to the Examiner's suggestions at pages 2 and 3 of the outstanding Office Action. Therefore, in view of the current amendments to the claims, Applicants respectfully submit that this rejection has been overcome and should be withdrawn.

Claim Rejections under 35 U.S.C. § 103

At page 3 of the outstanding Office Action, the Examiner has rejected claims 1-2, 4, 8 and 11-14 under 35 U.S.C. § 103(a) as being unpatentable over Kammler DE '726 (DE19516726A1) in view of Dries US '296 (US2003/0003296A1).

In view of the following remarks, Applicants respectfully request that the Examiner reconsider and withdraw the rejection.

Nonobviousness over the Combination of the Cited References

The technical issues resolved by the claimed invention are how to achieve effective sealing between a material comprising a fibrous paper or board layer and a counter-surface disposed against the material by using a polymer material in a sealing area between the two materials. The solution provided by the present invention is directing a laser radiation beam from a diode or Nd:YAG laser source through the fibrous layer to the sealing area, and using a radiation absorbing pigment located in the sealing area so as to effectively melt the polymer and form the seal. In the present invention, employment of a diode or Nd:YAG laser is essential for avoiding cutting or burning of the fibrous paper or board layer, while the pigment is employed to melt the polymer by means of laser radiation which passes through the fibrous layer.

None of the cited references discloses or suggests the features of the claimed invention. For example, Kammler DE '726 aims at laser sealing of a polymer coated board by means of laser radiation passing through the fibrous board layer. As stated in the Office Action, Kammler DE '726 fails to disclose or suggest employment of a diode or Nd:YAG laser.

Furthermore, Kammler DE '726 fails to disclose or suggest excellent results in connection with sealing, which is attained by the claimed invention since Kammler DE '726

does not provide any test results to verify the allegation set forth in the Office Action. For example, according to column 5, lines 40-43 of Kammler DE '726, the material to be sealed can be polyethylene-coated board. Kammler DE '726 teaches that the absorbed energy should be kept low enough to avoid the risk of burning (see also column 2, lines 20-22). At the same time, the skilled person is taught to increase the radiation intensity (see column 4, lines 2-4). From these teachings, Kammler DE '726 teaches away from the claimed invention.

The well-known CO₂ laser is effective in melting and sealing polymers, but the laser energy would be absorbed by the paper or board layer, which would be cut or burnt as a result. In this regard, for the Examiner's assistance, an article "*Laser Cutting of Pigment Coated Boards*" is attached hereto, which describes that the laser energy would be absorbed by the paper or board layer, which would then be cut or burnt as a result.

A diode or Nd:YAG laser does not burn a fibrous layer, but the laser beam is scattered and mostly reflected back without being absorbed. Only a small fraction of the radiation is transmitted through the layer.

Additionally, in general, due to the scatter, the radiation can be insufficient to melt polymer located on the reverse side of the fibrous layer. However, the inventors found that, by placing a radiation absorbing pigment selectively in predetermined sealing areas, the heating and melting effect is enhanced, so that sealing is achieved in spite of the weakened intensity of the transmitted radiation, while there is no sealing outside those selected areas due to insufficiency of the transmitted radiation to melt the polymer without the aid of the pigment. In view of the test results performed by the inventors (see *e.g.*, Example of the specification), without the use of a selectively located absorbing pigment, a diode or Nd:YAG laser does not successfully produce sealing, whereas by employing the pigment sealing is successfully achieved.

Further, the secondary reference Dries US '296 also fails to disclose or suggest the claimed features. For example, Dries US '296 merely discloses a use of a radiation absorbing pigment in Nd:YAG laser sealing (bonding) but does not relate to fibrous paper or board materials with the absorption or burning problem. Dries US '296 merely discloses bonding of polymer films. At paragraph [0085], Dries US '296 teaches that the laser beam shall not be absorbed in the base layer but instead passes through the other layers unhindered in the desired manner. A skilled person would understand this as a prerequisite for successful use of the bonding technique of Dries US '296. At the same time, the skilled person would be taught away from adapting the teachings for sealing paper or board, in the case of CO₂ laser, the beam would be absorbed; in the case of Nd:YAG laser, the beam would be scattered. Thus, Dries US '296 fails to disclose or suggest that the beam passes through the paper or board base. The discovery of the present inventors, that Nd:YAG or diode laser work if a radiation absorbing pigment is provided at the seal, is not disclosed or suggested in the cited references at all.

Therefore, there is not provided any rationale and/or reasonable expectation of success based on the combination of the cited references, by which one skilled in the art could arrive at the present invention as claimed, since the cited references fail to disclose or suggest each of the instantly claimed features and further teach away from the claimed features, as explained above. Thus, it is submitted that the present invention is not obvious over Kammler DE '726 in view of Dries US '296.

Based on the foregoing considerations, Applicants respectfully request that the Examiner withdraw the rejections.

CONCLUSION

Based upon the amendments and remarks presented herein, the Examiner is respectfully requested to issue a Notice of Allowance clearly indicating that each of the pending claims is allowed.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Toyohiko Konno, Registration No. L0053, at the telephone number of the undersigned below to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Director is hereby authorized in this, concurrent, and future replies to charge any fees required during the pendency of the above-identified application or credit any overpayment to Deposit Account No. 02-2448.

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Respectfully submitted,

By 

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Attachment: Article "*Laser Cutting of Pigment Coated Boards*"(10 pages)